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Prevalence and Severity of Foot Ulcers among Diabetic Patients Attending Diabetic Clinics at Ministry of Health (Moh) in Jordan

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Abstract

Diabetes mellitus is a serious, complex, and chronic disease, where many complications can affect and threaten the individual's life. Foot ulcers are one of the most serious and costly complications of diabetes, they contribute significantly to the patients morbidity and mortality. Diabetic patients with foot ulcers require long hospitalization, rehabilitation, increased need for home care and social services and carry risk of lower extremity amputations which usually preceded by a foot ulcer. Of note, many of these ulcers are preventable. Data on prevalence of foot ulcers among diabetics are important to assess the burden of foot complications and to plan preventive measures. In Jordan there is paucity of data on such complications and associated risk factors.

Objective: This thesis examines the prevalence of foot ulcers and the risk factors that lead to foot ulceration among diabetic patients attending the Ministry of Health (MOH) diabetic clinics.

Setting: Two ministry of health centers (MOH) in Amman (Prince Hamzh Hospital (PHH), Albasheer Hospital)

Subjects: We included 1000 patients with type 1 or type 2 diabetes twenty years of age and morefrom two centers (Prince Hamzh Hospital (PHH), Albasheer Hospital) during the period from December 2013 till 15th march 2014.

Main outcome measures: Diabetic foot ulcers, peripheral sensory neuropathy, lower limb ischemia, foot deformities, lower limb amputations, risk category, obesity, smoking and hypertension.

Patients and methods: This is a cross sectional study of patients with both type 1and type 2 diabetes conducted at two centers of ministry of health (MOH) in Amman (Prince Hamzh Hospital (PHH), Albasheer Hospital).

Results: This study included a total of 1000 patients (428 males and 572 females) .the Mean age was 57.2 years , Mean duration of DM in years 9.5 years ,Eighty-six patients were found to have foot ulcers (prevalence 8.6%). Foot at risk was identified in 359 patients 35.9% (0.5% patients in risk category-1, 2.2% patients in risk category -2 and 33.2% patients in risk category-3). 13.5% had loss of protective sensation according to the 10g mono-filament, 10.5% had loss of vibratory sensation proved by the tuning fork test, 35.8% had callus, 57.% had dryness. 9.4% had loss of dorsa lispedis pulse, 3%

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had loss of posterior tibial pulse, and 5.1% had intermittent claudicating. Loss of protective sensation (p< 0.005) and loss of vibratory sensation (p <0.005) were significantly higher in diabetic patients with foot ulcers than those without foot ulcers. About 4.3% had Wagner's grade 1, 4.1% had Wagner's grade 2,0.2% had Wagner's grade 3. none of patents had Wagner's grade 4and 5.

Conclusion: The prevalence of diabetic foot ulcers among patients attending ministry of health clinics was 8.6%, and the main risk factors for developing foot ulcers are peripheral sensory neuropathy, duration of diabetes, treatment of diabetes and deformities. There was high prevalence of foot at risk among diabetic patients (35.9%). Foot ulcers are serious problem which requires proper identification of patients at risk and proper management.

Keywords: Patients; Health; Diabetes; Medical center; Hospital

Introduction

It is increasingly being recognized that diabetes is increasing at a fast rate. It is also becoming a major health problem in the world with over 194 million people worldwide affected in 2003, and it is expected to affect 333 million by the year 2025. Diabetes is an important cardiovascular risk factor, and is frequently associated with diseases such as new onset blindness, stroke, lower limb amputation, renal failure, and severe nerve damage [1,2].The prevalence of diabetes mellitusIn the Middle East according to few available reports is in the range of 4-14 % [3]. The overall prevalence of diabetes mellitus In Jordan according to Ajlouni et al in 2008 was 17.1% [4]. The World Health Organization (WHO) estimates that 15% of annual health budgets are spent on diabetes-related illnesses. The cost of medical care of patients with diabetes is 2-5 times higher than those without diabetes.[5]Diabetic patients require more frequent medical visits, purchase of supplies and medications, and they are more likely to require hospitalization [5]. It is estimated that the cost of diabetes and its chronic complications in the (U.S) ranges from 4.6 to 13.7 billion U.S. dollars annually [6]. Foot ulcers are considered the most common reason for hospital admission among patients with diabetes and they require a longer hospital stay compared to diabetic patients without ulcerations [1,5]. Diabetes is responsible for more than 50% of non-traumatic lower limb amputation and is responsible for over one million amputations each year all over the world [7]. People with diabetes are 15 – 40 times more likely to require lower-limb amputation compared to the general population [1,5,8]. Approximately, 85% of lower-limb amputations in patients with diabetes are preceded by foot ulceration [9,10].

Study Importance

This is the first study on the prevalence and severity of diabetic foot ulcers among diabetic patients attending the Ministry of Health (MOH) diabetic clinics. The only data available about the prevalence of foot ulceration in Jordan was published from the National center for Diabetes Endocrinology and Genetics (NCDEG)in 2007 by Allan et al , showing a prevalence of foot ulcers (4.6%), and another one from the same center in 2009 by Al-Ayed et alshowing a prevalence of foot ulcers (5.3%), and last one on the refugee camps in Jordan in 2010 by Qasual et al that showing a prevalence of diabetic foot ulcers (1.8%) [11]. The three studies, however, were basically conducted in Amman, the first two at (NCDEG) in Amman and another study for (UNRWA) centers in Amman. The Ministry of health is considered the main provider of health care in Jordan; however, there is still a lack of information about the prevalence of diabetic foot ulcers among patients attending the Ministry of health diabetic clinics. Based on the results of this proposed study, we will be able to put forwarda national diabetic foot management guidelines and policies in Jordan. Therefore we study the prevalence of diabetic foot ulcers in patients attending diabetic clinics at (MOH) because the number of patients attending (MOH) is larger than any medical center in Jordan and this data will influence the prevention and treatment of complications of diabetes.

Objectives Study

a) To estimate the prevalence of foot ulcers among diabetic patients attending Ministry of Health diabetic clinics (MOH) in Jordan.
b) Determine the risk factors associated with foot ulcers.
c) Classifying foot ulcers according to Wagner classification system and relate them to risk factors associated with foot ulcers.

Asia

Data relating to diabetic foot problems is sparse. The International Working Group on the diabetic foot has reported that only five specialist foot care clinics exist in China [5]. As podiatry services are not readily available in China amputations remain common. Nevertheless,

interest in the effect on the diabetic's feet is now increasing and some centers have established multidisciplinary teams India has the highest incidence of diabetics than any other country, and foot problems and amputations remain very common. Lack of awareness resulting in late diagnosis, resulting in gross infection is prevalent [12,13].

North, South and Central America

In the United States of America (USA), diabetic foot complications are a major cause of hospital admission, in 1997, nearly 70% of all amputations were performed on people with diabetes.[34] Foot ulcers and amputations are more common in ethnic minority groups, especially Hispanic and African Americans, who are less likely to have health insurance [14,15]. In the Caribbean, the prevalence of diabetes is approaching 20%, in many islands. Amputations amongst diabetic patients are among the highest in the world [16,17]. Diabetes is common in this region, ranging from 5% to 20% [18,19]. Leprosy and diabetic neuropathy still have a high incidence northern Brazil, and both can contribute to foot complications. Due to the excellent cooperation between Health-care professionals and the Ministry of Health with assistance provided by UK and US centers, diabetic foot care in Brazil is well organized. More than 60diabetic foot clinics in Brazil are active since the initiation of "Save the diabetic foot Brazil project" in 1992 [20]. These centers have been effective in reducing the amputation rates. In Colombia and in Costa Rica; multidisciplinary hospital-based wound clinics are available for the treatment of diabetic foot ulcers [21].

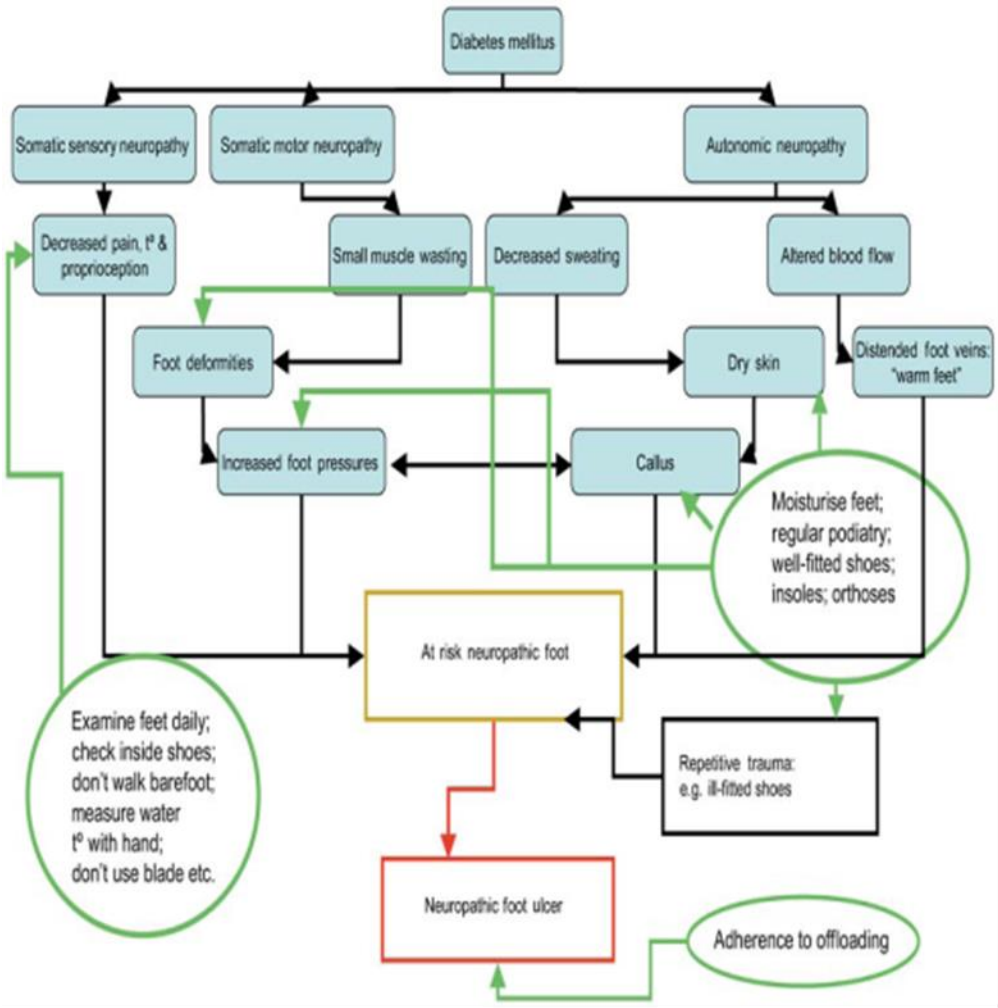

Figure (1): Causal pathways to foot ulceration emphasizing the key role of the patient in ulcer prevention (spheres and arrows); t, temperature. Illustration courtesy of L. Vileikyte

Risk category Classifications

Risk category classifications

The international working group on the diabetic foot has developed a system for the classification of risk that can predict which people with diabetes are at risk for diabetic foot problems. The classification consists of four risk group without risk factors to those with a previous ulcer [22] (Table 2).

Category	Risk profile
0	Sensation intact
1	Diminished sensation Blood supply intact, no foot deformation such as hammer or claw toes
2	Diminished sensation Blood supply compromised or foot deformity such as hammer or claw toes
3	Previous ulcer or amputation

Table 2: Risk- Categorization System for Diabetes Foot Complication (International working group on the diabetic foot).

In conclusion studies have shown that the best site in identifying the loss of protective sensation is testing 4 plantar sites on the forefoot (big toe and base of first, third and fifth metatarsals). These sites identify 90% of patients with an insensate site [23].

Two new classification systems

Two other wound classification systems also have been proposed recently. These include the S (AD) SAD system devised by MacFarlane and Jeffcoate [24]. This system includes size (area, depth) and then assess for sepsis, arterial disease and denervation. The authors claim that this is a robust classification system, but prospective validation requires to be completed before it can be recommended. Also, Foster and Edmonds have proposed a simple staging system which they have developed to provide a framework for the diagnosis and management of diabetic foot ulcers [11]. This system, which describes six stages, is based upon the natural history of the diabetic foot and it's progression to amputation. It is important in foot ulcer assessment to identify the location of foot ulcers. In the three large prospective studies, 53% of ulcers involve the toes and 22% involve the first metatarsal area.

Jordan and Arab study

To the best of our knowledge there are no studieseither from Jordan or the Arab countries about risk category classification and Wagner classification for lesions of diabetic foot, however, there are few studies related to the foot ulcers.

Jordan

A study was done in Jordan by Younes et al. (2003). It examined the validity of the new scoring system in predicting the outcomes of diabetic foot ulcer. It was applied to 84 consecutive patients with type 1 and 2 diabetes and foot ulcers at Jordan university hospital. The scoring

system (DEPA score) includes the depth of ulcer (D), the extent of bacterial colonization(E), the phase of ulcer healing(P), and the associated underling etiology(A). The results of that study were 32 patients had a DEPA score of ≤ 6, 34 patients had a DEPA score of 7 to 9, and 18 patients had a DEPA score of ≥ 10. The study showed that an increasing DEPA score is associated with increased risk of amputation and poor healing. another study conducted in 2001 at the National Center of Diabetes, Endocrinology and Genetics (Amman, Jordan) by Abdul Kareem S. Jbour. It is titled (Prevalence and Predictors of Diabetic Foot Syndrome in Type 2 Diabetes Mellitus in Jordan). It aimed at detecting foot changes and to identifying risk factors leading to amputation among type 2 diabetes. It included 1142 patients with Type- 2 diabetes mellitus (595 male and 597 female). And the result of foot ulceration was 4%. For Epidemiology of foot ulceration and amputations in Jordan see (Table 5).

Prevalence		Sitting	No	Year	By
Amputation	Ulcers				
5	4	NCDEG	1142	2001	Jbour et al [25]
2.1	4.6	NCDEG	1000	2007	Allan et al
1.7	5.3	NCDEG	1000	2009	Al-Ayed et al
0.4	1.8	(UNRWA) centers in Amman	1000	2010	Qasual et al

Table 5: Epidemiology of foot ulceration and amputations in Jordan.

Patients And Methods

Purpose: To determine the frequency of diabetic foot ulcers and associated risk factors indiabetic Jordanian patients.

Design: This is a cross sectional study conducted at two centers ((Prince Hamzh Hospital (PHH), Albasheer Hospital)) of ministry of health (MOH) in Amman**.**

Setting: Two centers of ministry of health (MOH) in Amman ((Prince Hamzh Hospital (PHH), Albasheer Hospital))

Population: We included 1000 patients equally from tow centers ((Prince Hamzh Hospital (PHH), Albasheer Hospital)) during the period from December 2017 till 15th march 2018. All patients with type 1 or type 2 diabetes, 20 years of age or older were included. Participants were selected systematically with every second patient form those attending the (MOH) centers, these were patients who attended the clinics for medical care. Diagnosis of diabetes was ascertained by retrospective reviewing of the medical records. This searched for receipt of insulin and oral hypoglycemic agents and reviewing laboratory glucose values. Participants were interviewed, after explaining the study to the patients. A verbal consent was obtained from all participants.

Data Collection and procedures: A standardized data Collection measurement form (appendix A), constructed by the investigator, and was used to record data from reviewing the medical records, interviewing and examining the patients. The investigator would stay in an exam room in the clinic while the reception nurse would ask patients in the waiting room if they agree on participating in free foot screening exam for research, if the patients agree they would be lead to the exam room and get examined by the investigator, the screening took part in the same clinic, and during the day clinic from 8 am till 12 pm except weekends. Patients were asked about their name, age, gender, weight, height, presence of hypertension, duration of diabetes, most recent three values of HbA1C, smoking, type of diabetes (Type-1), or (Type-2), treatment modality; diet only, oral only, insulin only, oral and insulin. vascular assessment by palpatingdorsalispedis pulses, posterior tibial pulses, and present of intermittent claudication , Neurological assessment also is done by checking loss of protective sensations via (10g mono-filament), vibratory sensation via (tuning fork), and presence of painful neuropathy., musculoskeletal assessment including foot deformity, limited joint mobility and amputations , dermatologicalassessment by quality, color and temperature and presence of dermatological abnormality such as callus, fissures and swelling . Nail assessment including long , involuted and subungualhaematoma toe nails , footwear assessment by fit , style , and condition , smokingstatus, previous ulceration, and risk category, were all collected and recorded by theinvestigator who is a podiatric nurse practitioner . Ulcers were defined as a full thicknesswound below the ankle; skin necrosis and gangrene are also included as ulcers. The definedulcers were classified according to Wagner's classification. Definition of all variables is listedin detail below.

Deformity was evaluated by inspection

a. **Body Mass Index** Was classified as, ratio of weight in Kg to height in squared meter. WHO criteria for adults were used to classify BMI as follows:-

*Normal BMI if < 25 *Overweight when BMI 25-29.9

*Obese if BMI ≥ 30

b. **Glycosylated hemoglobin (HbA1C)** was analyzed by using a high-performance liquidchromatography (HPLC) method (Bio-Rad), and performed in the labs of (MOH); good glycemic control if HbA1C < 7%, poor glycemic control if HbA1C > 7 %.

Definition and Assessment

Vascular Assessment: the researcher was checking out the vascularity by palpating the dorsalispedis on the top of the foot between the first and second metatarsal bones (Figure 6), and the posterior tibial pulses on the area behind the medial malleolus (Figure 7). Intermittent

claudication was evaluated by asking the patient if he had pain in foot, thigh, or calf which is aggravated by walking and is relieved by rest. However, the absence of pain does not always indicate a well perfused limb, as pain may be reduced in the presence of neuropathy. The researcher used the 10-g Semmes-Weinstein monofilament as the following: First, the researcher applied the monofilament to the patient's hands, so the patients know what to expect. The patient must not see where the examiner applied the filament test. And the four sites should be tested as shown in (Figure 8). The monofilament was applied to the skin surface perpendicularly and the force should be sufficiently to cause the filament to bend or buckle (Figure 9). Skin contact and removal of the filament should be approximately within 2 seconds. The monofilament should be applied to the perimeter area and not to an ulcer site, callus, scar or necrotic tissue. The filament was not allowed to slide across the skin or make repetitive contact at the test site the filament was pressedto the skin and the patient was asked if he feels the pressure applied (yes/no), and then asked where hefeels the pressure (left/right foot). The application was repeated twice at the same site, alternating this with at least one "sham" application, in which no filament is applied (total three questions per site). If the patients correctly answer two out of three applications, this means Protective sensation is present whereas if the patients incorrectly answer two out of three applications Protective sensation is going to be absent, and the patients are considered to be at risk of ulceration. Vibration perception was examined by using a 128 Hz tuning fork (it is applied to a bony part on the dorsal side of the distal phalanx of the first toe). First of all, apply the tuning fork on the patient's wrist, so that the patient knows what to expect. The patient must not see where the examiner applies the tuning fork. The tuning Fork should be applied to a bony part on the dorsal side of the distal phalanx of the first toe (Figure10). It should be applied perpendicularly with a constant pressure. Repeat this application twice, but alternate this with at least one "sham" application, in which the tuning fork is not vibrating. If the patients correctly answer two out of three applications, this means vibratory sensation is present whereas if the patients incorrectly answer two out of three applications, vibratory sensation is going to be absent, and the patients are considered to be at risk of ulceration.

Painful neuropathy: Was evaluated by asking the patient if he had signs of parasthesia or severe burning sensation.

Blood pressure: It was measured for the patient in sitting position, by using standardized sphygmomanometer with a cuff circumference of 24-32 cm.

Hypertension: Patients will also consider hypertensive if he/she is taking antihypertensive drugs. Or it was defined as reported physician diagnosis.

Statistical Analysis

Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS, version 20). Initially, the data were examined for data entry errors and outliers values. Detected errors were corrected as appropriate. Descriptive statistics were obtained, such as mean values for continuous variables and proportions for categorical variables. The chi-square test was used to assess statistical significance for differences of categorical variables.

A p-values > 0.05 was considered statistically significant.

Ethical Consideration

Approval was obtained from Ministry of health. And confidentiality was taken into consideration, with the data being used only for scientific aspects. Moreover, participation was optional and the data were conducted after talking the verbal approval from the patients themselves.

Consent: Verbal consent from patients was obtained before data collection.

Participants characteristics:

This study included a total of 1000 patients (428 males and 572 females). The (Mean ± SD) age was 57.29±13.33 ,42.6 % aged above 60 years ,43.3 % were overweight and 46.1 % were obese. The Socio demographics and relevant characteristics of participants are show in (Table 6).

Characteristic	Frequency	Percentage %
Gender		
Male	428	42.8
Female	572	57.2
Age / Years Mean ± SD = 57.29 ± 13.33		
≤50	283	28.3

51-60	291	29.1
>60	426	42.6
Weight (Kg) (Mean ± SD) 81.82 ± 12.1		
Height (cm) (Mean ± SD) 165.41± 7.13		
Body mass index		
Normal	106	10.6
Over weight	433	43.3
Obesity	461	46.1
Smoking		
Non	699	69.9
Past	106	10.6
Current	195	19.5
Job		
Unemployed	616	61.6
Employed	384	38.4
Income		
≤500 JD	922	92.2
>500JD	78	7.8

Table (6): Socio demographics and relevant characteristics of participants.

Table 7 shows the clinical and anthropometric characteristic of the study population.

Approximately, 50.9% of the subjects had hypertension, 96.1% had Type- 2 DM, 68.8% had DM for more than 5 years ,59.8% of the participant were on oral DM treatment, 25.2% were using insulin and oral hypoglycemic drugs and 13.5% were on insulin only. About 8.6% had ulceration, 90.3% had uncontrolled diabetes, 13.5% had loss of protective sensation according to the 10g mono-filament, 27.7% had painful neuropathy, 10.5% had loss of vibratory sensation proved by the tuning fork test, 35.8% had callus, 36% had fissures, 57.5% had dryness. 9.4% had loss of dorsalispedis pulse, 3% had loss of posterior tibial pulse, and 5.1% had intermittent claudicating.

Characteristic	Frequency	Percentage %
Hypertension		
Yes	509	50.9
No	491	49.1
DM type		
Type 1	39	3.9
Type 2	961	96.1
Duration of DM in years (Mean ± SD) 9.56 ± 6.61		
≤5	312	31.2
>5	688	68.8
Treatment of diabetes		
Dietalone	15	1.5
Oralalone	598	59.8
Insulinalone	135	13.5
Oral and insulin	252	25.2
Impaired Eye Sight		
Yes	369	36.9
No	631	63.1
Ulceration		

Present	86	8.6
Absent	914	91.4
HbA1C		
<7 %	97	9.7
≥ 7 %	903	90.3
Present	865	86.5
Absent	135	
Painful Neuropathy		
Present	277	27.7
Absent	723	72.3
Tuning fork (sensation)		
Present	895	89.5
Absent	105	10.5
Callus		
Present	358	35.8
Absent	642	64.2
Dryness		
Present	575	57.5
Absent	425	42.5
Amputations (overall)	30	3
Fissures		
Present	360	36
Absent	640	64
DorsalisPedis Pulse		
Present	906	90.6
Absent	94	9.4
Posterior Tibial Pulse		
Present	970	97
Absent	30	3
Intermittent Claudiaction		
Present	51	5.1
Absent	949	94.9

Table 7: Clinical and anthropometric characteristics of the study population.

Risk categorization	Frequency	Percentage%
Category: 0	641	64.1
Category: 1	5	0.5
Category: 2	22	2.2
Category: 3	332	33.2

Table 8: Prevalence of foot at risk among diabetic patients according to the Risk.

The distribution of the Risk categorization among the sample is shown in Table 8. Most of the sample belongs to category 0 (64.1%), (0.5%) are in category 1, (2.2%) are in category 2, and (33.2%) are in category 3.

Wagner's Classification system	Frequency	Percentage%
Wagner's Grade : 0	295	29.5
Wagner's Grade : 1	43	4.3

Wagner's Grade : 2	41	4.1
Wagner's Grade : 3	2	0.2
Wagner's Grade : 4	0	0.0
Wagner's Grade : 5	0	0.0
Normal	619	61.9

Table 9: Prevalence of foot ulcers and pre foot ulcers according to Wagner classification.

The overall prevalence of ulcer is 8.6% . About 4.3% had Wagner's grade 1 ,4.1% had Wagner's grade 2 , 0.2% had Wagner's grade 3 .non of patents had Wagner's grade 4and 5.

Population

Variable	No ulcer	Ulcer	p-value
Gender			.474
Male	392(91.6%)	36(8.4%)	
Female	522(91.3%)	50(8.7%)	
Age			**.004**
≤50	268(94.7%)	15(5.3%)	
51-60	271(93.1%)	20(6.9%)	
>60	375(88%)	51(12%)	
BMI			**.034**
Normal	98(92.5%)	8(7.5%)	
Over weight	406(93.8%)	27 (6.2%)	
Obesity	410(89%)	51(11%)	
Smoking			.704
Non	642(91.8%)	57 (8.2%)	
Past	95(89.7%)	11 (10.3%)	
Current	177(90.8%)	18 (9.2%)	
DM type			**.028**
Type 1	39(100%)	0 (0%)	
Type 2	875(91.1%)	86(8.9%)	
Variable	No ulcer	Ulcer	p-value
Duration of DM			**.002**
≤5	297 (95.2%)	15 (4.8%)	
>5	617 (89.7%)	71 (10.3%)	
Treatment of diabetes			.110
Diet	15 (100%)	0 (0%)	
Oral	555 (92.8%)	43 (7.2%)	
Insulin	120 (88.9%)	15 (11.1%)	
Oral and insulin	224 (88.9%)	28 (11.1%)	
HBA1C			.063
≤7	93 (95.9%)	4 (4.1%)	
>7	821 (90.9%)	82 (9.1%)	
Deformity			**<.005**
Present	220 (84%)	42 (16%)	
Absent	694(94%)	44 (6%)	
Monofilament (sensation)			**<.005**
Present	835 (96.6%)	30 (3.4%)	
Absent	79 (58.5%)	56 (41.5%)	

Variable	No ulcer	Ulcer	p-value
Painful Neuropathy			**<.005**
Present	220(79.5%)	57 (20.5%)	
Absent	694(96%)	29 (4%)	
Tuning fork (sensation)			**<.005**
Present	863 (96.4%)	32 (3.6%)	
Absent	51 (48.6%)	54 (51.4%)	
DorsalisPedisPulse			**<.005**
Present	839(92.6%)	67 (7.4%)	
Absent	75(79.8%)	19 (20.2%)	
Posterior Tibial Pulse			**<.005**
Present	900(92.8%)	70(7.2%)	
Absent	14(46.7%)	16(53.3%)	
Intermittent Claudication			**<.005**
Present	28(55%)	23 (45%)	
Absent	886 (93.4%)	63(6.6%)	

Table 10: The correlation between foot ulcers and associated risk factors for the Study.

Variable	Frequency	(%)	NO ulcer	Ulcer	p-value
Calluses	358	35.8			**<.005**
Present			288 (80.5%)	70(19.5%)	
Absent			626 (97.5%)	16 (2.5%)	
Dryness	575	57.5			**<.005**
Present			511 (88.9%)	64 (11.1%)	
Absent			403 (94.8%)	22 (5.2%)	
Fissures	360	36.0			**<.005**
Present			291 (80.8%)	69 (19.2%)	
Absent			623 (97.3%)	17 (2.7%)	
Amputation	30	3.0			**<.005**
Present			9 (30%)	21 (70%)	
Absent			905 (93.3%)	65 (6.7%)	
Limited joint mobility	144	14.4			**<.005**
Present			102 (70.9%)	42 (29.1%)	
Absent			812 (94.9%)	44 (5.1%)	
Long toe Nail	377	37.7			**<.005**
Present			301 (79.8%)	76 (20.2%)	
Absent			613 (98.4%)	10 (1.6%)	
Ingrowing toe Nail	23	2.3			**<.005**
Present			9 (39.1%)	14(60.9%)	
Absent			905 (92.6%)	72 (7.4%)	
Ill fitting shoes	860	86.0			**<.005**
Good			139 (99.3%)	1 (0.7%)	
Poor			775 (90.1%)	85 (9.9%)	
Edema	200	20.0			**<.005**
Present			128 (64%)	72 (36%)	
Absent			786(98.3%)	14 (1.7%)	

Table 11: Frequency of local foot complicationsand the correlation between foot ulcers and associated risk factors for the Study Population.

Variable	Sig.	O.R	95.0% C.I.for EXP(B)	
			Lower	Upper
IntermittentClaudication Present Absent	.006	5.255 1	1.624	17.004
Dryness Present Absent	.011	.262 1	.093	.738
Amputation Present Absent	.001	12.067 1	2.656	54.825
LongToeNail Present Absent	.033	2.850 1	1.090	7.448
IngrowingToeNail Present Absent	.081	3.439 1	.859	13.767
Swelling Present Absent	0.00	32.966 1	11.709	92.816

Table 12: Logistic regression analysis of factors associated with foot ulceration. (The adjusted odds ratio with 95% confidence intervals estimation of Variable).

Logistic regression analysis was performed for the following variables: Intermittent claudication, dryness, amputation, long toe nail, in growing toe nail, swelling. We found that variables to be significant risk factors for developing ulcers. Table 12 shows the adjusted odds ratio with 95% confidence intervals for these risk factors. The logistic regression indicates that those with swelling are32.966times more likely to develop foot ulcer than subjects without swelling. (OR 32.966, 95% CI 11.709-92.816). Also patients who have amputation are12.067times more likely to develop foot ulcer compared with patients without amputation (OR 12.067,95% CI 2.656-54.825). Patients with intermittent claudication are 5.255times more likely to develop foot ulcer than subjects without intermittent claudication (OR 5.255,95% CI 1.624-17.004). Patients who have In growing toe nail are3.439 times more likely to develop foot ulcer compared with patients without ingrowing toe nail (OR 3.439, 95% CI .859-13.767). Moreover, patients with long toe nail are2.850times more likely to develop foot ulcer than subjects without long toe nail (OR 2.850, 95% CI 1.090-7.448).

Discussion

Our study showed the prevalence of foot ulcers to be 8.6%. According to our knowledge there are no previous studies in the ministry of health in Jordan. There are, however, previous studies in NCDEG on foot ulcers which showed a prevalence of foot ulcer of 5.3%. Another data available about the prevalence of foot ulceration in Jordan was published from the National center for Diabetes Endocrinology and Genetics (NCDEG) in 2007 by Allan et al. showing a prevalence of foot ulcers (4.6%), and another one from the same center in 2009 by Al-Ayed et al. showing a prevalence of foot ulcers (5.3%), and last one on the refugee camps in Jordan in 2010 by Qasual et al. that showing a prevalence of diabetic foot ulcers (1.8%). The three studies, however, were basically conducted in Amman, the first two at (NCDEG) in Amman and another study for (UNRWA) centers in Amman. Moreover, this is the second study in Jordan after (UNRWA) that is performed in the community, knowing that community based studies are more accurate than center based studies as the latter can overestimate the prevalence of diabetes complications including foot ulcers. Therefore, the higher prevalence of foot ulcers in our study (8.6%) compared to that found previously in the NCDEG respectively (4%) (4.6%) (5.3) could be attributed to the setting; community versus center based, with overestimation observed in the center based study. The Ministry of health is considered the main provider of health care in Jordan; therefore we studied the prevalence of diabetic foot ulcers in patients attending diabetic clinics at (MOH) because the number of patients attending (MOH) is larger than any medical place in Jordan and this data will influence the prevention and treatment of complications of diabetic disease. Studies from various parts of the world showed that the prevalence of foot ulcers was 1.7% in the United Kingdom[15], 2.5% in

Slovakia, [18] 3.6% in India, [20] and 11.9% in Algeria [19] Of note, the prevalence of foot ulcers among diabetic patient in our Ministry of health population was close to that in the developing countries like Algeria, but higher than the prevalence reported in other developed countries, and this might be due to the inadequate care of the healthcare workers in the Ministry of health clinics mainly through the health education and annually screening for the patients' feet. However, it is very difficult to make accurate comparisons between studies since the methods and settings of the studies are variable, and time periods over which data were obtained also is variable.

Risk category Classification

The observation that loss of sensation or foot deformity increases the risk for foot ulceration has important implications; the sequence of neuropathy, callus, and finally ulcer formation has prompted endocrinologists to concentrate on identifying foot at risk in patients with diabetes. Therefore, the international working group on the diabetic foot has established a risk category classification divided into four groups; Group 0 composed of patients without neuropathy, Group 1 composed of patients with neuropathy but without foot deformity, Group 2 composed of patients with neuropathy and foot deformity, Group 3 composed of patients with history of plantar ulceration. A study was done in France performed on 664 diabetic patients (72.8 %) of patients were belonging to category 0, (9.7%) in category 1, and (17.5%) in category 2 and 3 [26]. More patients in France (72.8 %) are in category 0 compared to our study which revealed that (64.1%) of our patients were in category 0, (0.5%) in category 1, and (35.4 %) in both category 2 and 3, could be attributed to the setting; community (our study) as (UNRWA study) versus center based (France study and NCDEG) see (Table 13).

Prevalence of category				Sitting	No	Year	By
3	2	1	0				
5.6	5.5	7.6	81.6	NCDEG	1000	2007	Allan et al.
2.8	8.2	6.2	82.8	NCDEG	1000	2009	Al-Ayed et al.
0.8	6	8	85.2	(UNRWA) centers in Amman	1000	2010	Qasual et al.
33.2	2.2	0.5	64.1	M.O.H	1000	2014	Current study

Table 13: Epidemiology of Risk category for studies in Jordan.

Wagner's Classification System

Some of these studies compared Wagner's classification with University of Texas wound classification system, and they showed that University of Texas system is a better predictor of outcomes than the Wagner's classification system [27]. Many other studies compared three ulcer classification systems (Wagner's, University of Texas, and SAD systems) and they conclude that all of three ulcer classification system predicted ulcer outcome [28]. In a study from Pakistan, 100 cases of diabetic foot ulcers were evaluated according to Wagner's classification system, 6% of patients were within Wagner's grade 0, (14%) in Wagner's grade 1, (25%) in Wagner's grade 2, (30%) in Wagner's grade 3, (21%) in Wagner's grade 4, and (4%) were in Wagner's grade 5 [78]. Another study was done in Cameron on 300 diabetic patient show prevalence of foot ulcers 13%, ulcers were evaluated according to Wagner's classification system the result show that (43.6%) of the patients were in Wagner's grade 0, (30.8%) were in Wagner's grade 1, (7.7%) were in Wagner's grade 2, (10.3%) were in Wagner's grade 3, (7.7%) were in Wagner's grade 4 and none patients was in Wagner's grade 5.

By	Year	No	Sitting	Wagner's classification system						
				Normal	0	1	2	3	4	5
Allan et al.	2007	1000	NCDEG	87.8	7.3	3.5	1.0	0.4	0.0	0.0
Al-Ayed et al.	2009	1000	NCDEG	62.8	31.8	2.5	1.4	1.2	0.3	0.0
Qasualet al.	2010	1000	(UNRWA) centers in Amman	92.9	5.3	1.3	0.4	0.1	0.0	0.0
Current study	2014	1000	M.O.H	61.9	29.5	4.3	4.1	0.2	0.0	0.0

Table 14: Epidemiology of Wagner's classification for studies in Jordan.

The results of our study showed that (29.5%) of the patients were in Wagner's grade 0, (4.3%) were in Wagner's grade 1, (4.1%) were in Wagner's grade 2, (0.2%) were in Wagner's grade 3, and none of our patients was in Wagner's grade 4 and 5.see (Table 14).

Compared with the studies published from Jordan (Table 13), the overall prevalence of foot ulcers among our patients according to Wagner's grade (,1,2,3) is more than from these studies which could be attributed to the setting; community (public health center) versus center and due to the fact that the total number of ulcers in our patients is more than. or because of the differences in the definitions of the variables such as; osteomyelits between their studies .

Foot Ulcers and Associated Risk Factors

Diabetic foot ulcers were significantly associated with increasing age, type of diabetes, increasing duration of diabetes, peripheral sensory neuropathy, deformities, and limited joint mobility. This is in accordance with previous literature [1,8,10]. In our study there was a high prevalence of preventable risk factors, such as calluses 356 (35.6%), dryness 575 (57.5%), and fissures 360 (36.0%) which might be related several factors, such as walking barefoot, illiteracy, and lack of knowledge from the patient himself and his family as well. This is an area where health care providers should play a stronger role in education and prevention programs.

No correlation was found between the, gender, smoking and type of treatment with foot ulceration, according to our study. In our study, diabetic foot ulcers were significantly associated with age, duration of diabetes. And it was significantly associated with loss of protective sensation, loss of vibratory sensation, Callus, Deformity, fissures, Dry ness and Vascular insufficiency. Loss of protective sensation is one of the most important factors leading to diabetic foot ulceration. In our study showed significant association between loss of protective sensation and foot ulceration. This is in accordance with previous literature. We used the 10-g Semmes Weinstein mono-filament in evaluating the loss of protective sensation, which is considered the most effective screening method for the loss of protective sensation among diabetic patients. Loss of protective sensation remains the most important risk factor for amputation and ulceration in diabetics, and the reported prevalence of neuropathy in patients with ulcers is between 70-100%. This reflects the significance of early identification of this complication to implement proper care and education, and identifying patients at risk.

Loss of vibration sense is also considered one of the forms of neuropathy that may play a role in foot ulceration. And this is in accordance with previous literature. Vibrations perception was examined by using a 128 Hz tuning fork in our study and showed significant correlation with foot ulceration.

Vascular insufficiency was defined as the absence of posterior tibial artery pulses with or without symptoms and signs of PVD or the absence of dorsalis Pedis pulses with at least one symptom or sign indicating PVD, and intermittent claudication. Lower limb ischemia prevalence was seen in 1.6% of patients in our study. However, we should note that lower limb ischemia might be under-estimated as we relied only on clinical exam to detect this complication; this may not be a sensitive test as neuropathy may mask some of the symptoms. Nonetheless this is close to the prevalence seen in developing countries; a previous study comparing the risk factors between developing and developed countries found that lower limb ischemia were more common in developed countries compared to developing countries; PVD was a frequent risk factor in Germany (48%), on the other hand it was far less common (12 and 13%) in Tanzania and India respectively. The prevalence of ill foot wear, an important factor in developing foot ulcers, was 86%, an extremely high rate. This reflects both poor foot care and the absence of specialized footwear support services, and lack of knowledge of the importance of foot wear in diabetics. These factors also need to be addressed by health care professionals involved in diabetes care. Finally, it is obvious that diabetes is a major risk factor for foot ulcer in Jordan. We recommend implementation of management guideline in order to help control the long term complication of diabetes. This may include life style modification and proper medication. Additionally, screening of foot at risk should be initiated at an early point in the course of the disease, so that the management can be started before the development of the ulceration. We recommended further studies on the long term complications of diabetes.

Conclusions and Recommendations

Conclusions

Our study showed the following:

a. The prevalence of foot ulceration at (M.O.H) population in Jordan 8.6%.
b. There are many factors that lead to foot ulceration:
c. Loss of protective sensation.
d. Loss of vibratory sensation.
e. Duration of diabetes mellitus.
f. Dryness and fissures.
g. Deformity.

h. Vascular insufficiency.
i. Ill-fitting shoes.
j. Although the prevalence of foot ulceration and their complications are relatively high, foot care in diabetic patients in primary care can be improved.
k. The above reflects considerable lack of preventive and educational practices in the diabetic foot care, and different diabetic population characteristics than that found in developed countries.
l. There was high rate of prevalence Wagner grade 1&2 8.4% which needs follow-up and good care.
m. Future efforts should be directed towards educating both the healthcare professionals and patients about the proper foot care.

Recommendations

a. All patients with diabetic foot ulcers and their caregivers need to understand this condition; this might be achieved by formal training for healthcare providers, and educating the patients during clinic visit or special classes.
b. 2 -Health education is an essential strategy for better documentation and prevention or reduction of complications.
c. Health care providers should have complete documentation for foot complications with emphasis on vascular status, infection, callus, neuropathy, foot deformity/pressure, and ulcers.
d. Assess all patients with diabetic foot ulcers for signs and symptoms of infection.
e. Assess all patients with diabetic foot ulcers for signs and symptoms of peripheral neuropathy for sensory, autonomic and motor changes.
f. Assess all patients with diabetic foot ulcers for signs and symptoms for foot pressure, deformity, gait, footwear and devices, and facilitate appropriate referrals.
g. Establish multidisciplinary foot care teams to provide local wound care, debridement, infection control, and provide pressure redistribution.

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